placing a living biological sample and optional associated fluids into a container, the container including a substrate having thereon a plurality of independently-addressable electrodes;

applying independently-definable electrical potentials to the plurality of independently-addressable electrodes over a period of time, wherein areas of the living biological sample are exposed to electric fields while being exposed to otherwise substantially similar environmental conditions; and

examining the living biological sample to assess effects of those electric fields on a biological function of the living biological sample, wherein the optimal electric field may be systematically determined.

34. (Original) The method of Claim 33 wherein the plurality of independently-addressable electrodes maintain substantially ohmic contact with the living biological sample.

35. (Original) The method of Claim 33 wherein the plurality of independently-addressable electrodes are substantially not in ohmic contact with the living biological sample and those electric fields are capacitively coupled to the living biological sample.

36. (Original) The method of Claim 33 wherein the plurality of independently-addressable electrodes are substantially not in ohmic contact with the living biological sample and those electric fields are inductively coupled to the living biological sample.

37. (Original) The method of Claim 33 wherein at least one surface of the container is substantially transparent and the living biological sample may be visually examined during a period of time during which the living biological sample is exposed.

38. (Original) The method of Claim 37 wherein visual examination is performed with an optical microscope.

39. (Original) The method of Claim 33 further comprising utilizing a porous layer disposed proximate to the electrodes to immobilize cells in locations relative to the plurality of independently-addressable electrodes during the period of time.

40. (Original) The method of Claim 39 wherein the porous layer includes a material selected from the group consisting of agar, gelatin, cross-linked hydrogels, low-density polyethylene, and porous ceramics.

41. (Original) The method of Claim 39 wherein the porous layer includes a chemical staining agent and colonies of those cells may be more readily visible.

42. (Original) The method of Claim 33 wherein the container includes a plurality of individual chambers and means for maintaining an independently-definable electric field in each of the chambers and contents of each of the plurality of individual chambers may be kept separate from one another.

43. (Original) The method of Claim 42 wherein the contents of at least some of the plurality of individual chambers are different and at least one experimental parameter in addition to electric field may be varied while holding other environmental conditions substantially constant.

44. (Original) The method of Claim 43 wherein the living biological sample includes pathogenic bacteria and the plurality of individual chambers contain selected concentrations of at least one antibiotic compound.

45. (Original) The method of Claim 33 wherein the independently-definable electrical potentials are selected from the group consisting of continuous DC, pulsed DC, and AC.

46. (Original) The method of Claim 42 wherein each of the plurality of individual chambers includes a porous, electrically conductive structure in electrical contact with one of the plurality of

independently-addressable electrodes and those electric fields may be applied to a film of bacteria growing on the porous, electrically conductive structure.

47. (Original) The method of Claim 33 wherein the selected biological function is selected from the group consisting of: cell growth, proliferation and/or inhibition; platelet adhesion on a surface; gene expression; protein and/or hormone production; cell mobility and/or alignment; healing and/or scar formation; osteoclast, osteoblast and/or macrophage behavior; germination of seeds and/or spores; bacterial growth and/or inhibition; inflammatory responses; release of cell metabolites; and uptake of pharmaceuticals.

48. (Original) A method for determining an optimal electric field for enhancing a selected biological process comprising:

placing a living biological sample and optional associated fluids into a container, the container including an electrically insulating structure having thereon a plurality of independently-addressable electrodes;

applying independently-definable electrical potentials to the plurality of independently-addressable electrodes over a period of time; and

examining the living biological sample to assess effects of those electric fields on a biological function of the living biological sample, wherein the optimal electric field may be rapidly determined.

49. (Original) The method of Claim 48 wherein the plurality of independently-addressable electrodes maintain a substantially ohmic contact with the living biological sample.

50. (Original) The method of Claim 48 wherein the plurality of independently-addressable electrodes are substantially not in ohmic contact with the living biological sample and those electric fields are capacitively coupled to the living biological sample.

51. (Original) The method of Claim 48 wherein the plurality of independently-addressable

electrodes are substantially not in ohmic contact with the living biological sample and those electric fields are inductively coupled to the living biological sample.

52. (Original) The method of Claim 48 wherein at least one surface of the container is substantially transparent and the living biological sample may be visually examined during a time period during which the living biological sample is exposed.

53. (Original) The method of Claim 52 wherein visual examination is performed with an optical microscope.

54. (Original) The method of Claim 48 further comprising utilizing a porous layer disposed proximate to the electrodes to immobilize cells in locations relative to the plurality of independently-addressable electrodes during the period of time.

55. (Original) The method of Claim 54 wherein the porous layer includes a material selected from the group consisting of agar, gelatin, cross-linked hydrogels, low-density polyethylene, and porous ceramics.

56. (Original) The method of Claim 54 wherein the porous layer includes a chemical staining agent and colonies of those cells may be more readily visible.

57. (Original) The method of Claim 48 wherein the container includes a plurality of individual chambers and means for maintaining an independently-definable electric field in each of the chambers and contents of each of the plurality of individual chambers may be kept separate from one another.

58. (Original) The method of Claim 57 wherein the contents of at least some of the plurality of individual chambers are different and at least one experimental parameter in addition to electric field may be varied while holding other environmental conditions substantially constant.

59. (Original) The method of Claim 57 wherein the living biological sample includes pathogenic bacteria and the plurality of individual chambers contain selected concentrations of at least one antibiotic compound.

60. (Original) The method of Claim 48 wherein the independently-definable electrical potentials are selected from the group consisting of continuous DC, pulsed DC, and AC.

61. (Original) The method of Claim 57 wherein each of the individual chambers includes a porous, electrically conductive structure in electrical contact with one of the plurality of independently-addressable electrodes and those electric fields may be applied to a film of bacteria growing on the porous, electrically conductive structure.

62. (Original) The method of Claim 48 wherein the selected biological function is selected from the group consisting of: cell growth, proliferation and/or inhibition; platelet adhesion on a surface; gene expression; protein and/or hormone production; cell mobility and/or alignment; healing and/or scar formation; osteoclast, osteoblast and/or macrophage behavior; germination of seeds and/or spores; bacterial growth and/or inhibition; inflammatory responses; release of cell metabolites; and uptake of pharmaceuticals.